BACKBENDING AND BANDCROSSING IN MR BAND OF ^{137}Pr

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Magnetic Rotation has now been established in several mass regions [1]. However, isotopes of only few nuclei have been investigated in A=130 mass region. An experiment was performed to investigate the existence of Magnetic Rotation (MR) phenomenon in ^{137}Pr. The reaction ^{122}Sn(^{19}F,4n)^{137}Pr was carried out at 80 MeV beam from NSC Pelletron. Self supporting enriched ^{122}Sn target of thickness 1.2 mg/cm^2 was used. The Gamma rays were detected using phase-I of 8 CS-Clover detector INGA (Indian National Gamma Array) facility. The data have been sorted into E_γ–E_γ (4K X 4K) matrices. The MR band with ΔI =1 transitions, tentatively proposed earlier up to spin 41/2$^-$ [2] has been extended to higher spins with addition of several new transitions. We have extended the band up to 49/2$^-$ and also rearranged a couple of transitions. While M1 transitions are strong, very weak cross-over E2 transitions are also seen in gated sum spectra. On the basis of earlier studies and comparison with neighboring nuclei, we have assigned the configuration $\pi h_{11/2} \otimes (\nu\ h_{11/2})^2$ to this band. A calculation based on TAC model has been carried out and the results are shown in the figure. The MR band is found to be located in a local minimum at ε_2=0.135, ε_4=0.009, γ =58° with an average tilt angle θ=20°. Our calculations reproduce the band very well up to $\hbar\omega$=0.45 MeV. The experimental data exhibit a backbend/upbend between $\hbar\omega$=0.3 to 0.45 MeV. It is interesting that this feature is nicely reproduced by our calculations implying that the observed backbending is due to the shears mechanism of alignment of neutron and proton blades. The high spin part of the band appears to have a crossing with a band having different configuration, probably a 5 qp configuration. A small gain in alignment is also seen at $\hbar\omega$=0.6 MeV. Detailed calculations to understand these features are underway, and will be reported at the conference.

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[1] Amita *et al*., At. Data & Nucl. Data Table **74**, 283 (2000); revised table under publication.

[2] N. Xu *et al*., Phys. Rev. **C39**, 1799 (1989).